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(21) International Application Number: PCT/FI00/00139 (22) International Filing Date: 22 February 2000 (22.02.00) (30) Priority Data: 990396 24 February 1999 (24.02.99) FI (71) Applicant (for all designated States except US): NOKIA NETWORKS OY [FI/FI]; P.O. Box 300, Keilalahdentie 4, FIN-02150 Espoo (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): MOILANEN, Mikko [FI/FI]; Salontaantie 10, FIN-24800 Halikko (FI). (74) Agent: HEINÄNEN OY; Annankatu 31-33 C, FIN-00100 Helsinki (FI).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i> <i>In English translation (filed in Finnish).</i>
(54) Title: ANTENNA RADIATOR (57) Abstract <p>Antenna radiator, consisting of two plate-like or film-like parts (1, 2) connected by their foot ends (11) to each other and to the supply connection of the antenna. To reduce especially current and voltage losses, the radiator parts are substantially wider at the foot (11) than at the tip (12).</p>		

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ANTENNA RADIATOR

The present invention relates to an antenna radiator consisting of two plate-like or film-like parts connected by their foot ends to each other and
5 also to the supply connection of the antenna.

For instance, the base transceiver stations of mobile telephone systems use dipole antenna systems comprising dipole antennas adapted for one or more frequency ranges, e.g. 900 MHz and 1800 MHz. The antennas
10 have relatively narrow radiators which consist of two parts extending to both sides of the supply point of the antenna. The antennas have been made e.g. by etching on a fiberglass circuit plate. The radiators of the antennas are relatively narrow.

15 Due to the high frequencies used in mobile telephone systems, the circuit plate on which the antenna construction has been etched causes dissipation. The dissipation is mainly due to a large current flowing at the foot of the radiator parts and to voltage losses occurring at the tips of the radiator parts. A drawback with present antennas is the magnitude of
20 dissipation, which is a result of especially the fact that the radiator parts are narrow at the foot.

The object of the present invention is to eliminate the drawbacks of prior-art solutions and achieve a radiator structure especially applicable for
25 use in base stations of mobile telephone systems. The antenna radiator of the invention is characterized in that, especially to reduce current and voltages losses, the radiator parts are substantially wider at the foot than at the tip.

30 An embodiment of the invention is characterized in that the radiator parts taper from the foot towards the tip.

When a radiator according to the invention is used, dissipation caused by the circuit plate is reduced because the wide foot part reduces the losses
35 due to the current flowing in the foot. In addition, due to their narrow

shape, the tips have a small contact area, thus producing only small voltage losses. Therefore, a good radiation efficiency is achieved.

5 In the following, the invention will be described in detail by the aid of an example with reference to the attached drawing, which presents an antenna with a radiator according to the invention, suited for use e.g. in a base transceiver station of the 900 MHz mobile telephone network.

10 The dipole antenna presented in the figure comprises a film-like dipole radiator of electrically conductive material, consisting of two parts, an upper and a lower part 1, 2. The parts are connected together by a narrow metal strip 3. Placed behind the radiator 1, 2 is a reflector 4, whose length somewhat exceeds the height of the radiator. The radiator 1, 2 and the strip 3 have been etched on a fiberglass circuit plate 5. The
15 antenna is connected by a connecting cable 6 from the supply point at the middle of the strip 3 to the receiver-transmitter apparatus of a base transceiver station.

20 The radiator parts 1, 2 are of a triangular shape and symmetric with respect to each other so that the upper triangle points upward and the lower triangle 2 downward. Thus, each part 1, 2 tapers linearly from the foot end 11 towards the tip 12. The side 13 in the direction of the main beam is inclined while the side 14 next to the reflector 4 is upright.

25 In the radiator of the invention, the current density is significantly smaller than in prior-art solutions, especially at the foot 11 of the radiator parts 1, 2, where the current is largest, thanks to the width of the foot end structure. As the current is diminished toward the tip, the radiator part 1 tapers linearly, so that the tip 12 of the radiator, which is the most
30 sensitive area of the radiator in respect of the operation of the antenna, is narrow. In addition, the tip 12 has a blunt shape to avoid interference.

It is obvious to a person skilled in the art that different embodiments of the invention are not restricted to the example described above, but that
35 they may be varied within the scope of the claims presented below.

CLAIMS

1. Antenna radiator, consisting of two plate-like or film-like parts (1, 2) connected by their foot ends (11) to each other and to the supply
5 connection of the antenna, c h a r a c t e r i z e d in that, to reduce especially current and voltage losses, the radiator parts are substantially wider at the foot (11) than at the tip (12).
2. Radiator as defined in claim 1, c h a r a c t e r i z e d in that the
10 radiator parts (1,2) taper from the foot (11) toward the tip (12).
3. Radiator as defined in claim 2, c h a r a c t e r i z e d in that the radiator parts (1,2) taper substantially linearly from the foot (11) toward the tip (12).
15
4. Radiator as defined in claim 1 in an antenna provided with a reflector (4) behind the radiator, c h a r a c t e r i z e d in that the edge (13) of the radiator part on the side facing in the direction of radiation is straight while the edge (14) opposite to the direction of radiation is
20 inclined, or vice versa.
5. Radiator as defined in claim 1, c h a r a c t e r i z e d in that the radiator parts (1,2) are connected to each other via a narrow strip-like connecting part (3), the supply connection of the antenna being fitted in
25 conjunction with it.
6. Radiator as defined in claim 1, c h a r a c t e r i z e d in that the radiator has been fitted on a circuit plate (5).

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER IPC7: H01Q 9/16 According to International Patent Classification (IPC) or to both national classification and IPC				
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) IPC7: H01Q Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched SE,DK,FI,NO classes as above Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)				
C. DOCUMENTS CONSIDERED TO BE RELEVANT				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	US 5293175 A (DALE L. HEMMIE ET AL.), 8 March 1994 (08.03.94), column 3, line 19 - line 48, figures 1-2,4-5 --	1-6		
A	EP 0889543 A1 (SONY INTERNATIONAL (EUROPE) GMBH), 7 January 1999 (07.01.99), column 6, line 58 - column 7, line 14; column 9, line 57 - column 10, line 26, figures 2,6 -- -----	1-6		
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
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Information on patent family members

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	5293175	A	08/03/94	US	5229782 A	20/07/93
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